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SEQUENCE LISTING

<110> INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE
THE INSTITUTE FOR GENOMIC RESEARCH

<120> EAST COAST FEVER VACCINE BASED ON CTL-SPECIFIC
SCHIZONT ANTIGENS

<130> 41860-205199

<140>

<141>

<150> 60/504,428

<151> 2003-09-22

<160> 53

<170> PatentIn Ver. 3.2

<210> 1

<211> 174

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of Tp2:

<400> 1

Met Lys Leu Ala Ala Arg Leu Ile Ser Leu Tyr Phe Ile Ile Tyr Ile
1 5 10 15

Leu His Ser Pro Val Leu Gly Gly Asn Cys Ser His Glu Glu Leu Lys
20 25 30

Lys Leu Gly Met Leu Glu Gly Asp Gly Phe Asp Arg Asp Ala Leu Phe
35 40 45

Lys Ser Ser His Gly Met Gly Lys Val Gly Lys Arg Tyr Gly Leu Lys
50 55 60

Thr Thr Pro Lys Val Asp Lys Val Leu Ala Asp Leu Glu Thr Leu Phe
65 70 75 80

Gly Lys His Gly Leu Gly Gly Ile Ser Lys Asp Cys Leu Lys Cys Phe
85 90 95

Ala Gln Ser Leu Val Cys Val Leu Met Lys Cys Arg Gly Ala Cys Leu
100 105 110

Lys Gly Pro Cys Thr Asp Asp Cys Gln Asn Cys Phe Asp Arg Asn Cys
115 120 125

Lys Ser Ala Leu Leu Glu Cys Ile Gly Lys Thr Ser Ile Pro Asn Pro
130 135 140

Cys Lys Trp Lys Glu Asp Tyr Leu Lys Tyr Lys Phe Pro Glu Thr Asp
145 150 155 160

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Glu Asp Glu Ser Thr Lys Lys Gly Glu Ala Ser Gly Thr Ser
165 170

<210> 2
<211> 265
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence of Tp3

<400> 2
Met Lys Leu Asn Thr Ile Ala Ile Ala Phe Leu Tyr Ser Cys Phe Ser
1 5 10 15

Gln Phe Leu Lys Asn Val Ser Ala Leu Arg Arg Ser Ser Pro Asp Leu
20 25 30

Ser Pro Asp Gly Ser Phe Leu Gln Val Lys Ser Ala Ser Pro Gln Asp
35 40 45

Lys Gln Asp Val Ile Gln Ser Ser Ser Pro Lys Val Thr Val Pro Thr
50 55 60

Val Asp Pro Glu Gly Leu Lys Lys Ala Val Thr Ala Ala Val Leu Ser
65 70 75 80

Asn Gln Asn Gln Ala Leu Gln Asn Gly Ala Leu Asn Pro Ala Asp Phe
85 90 95

Thr Gln Ala Ala Ser Val Asn Ser Met Ser Asn Ala Val Ser Ala Met
100 105 110

Asn Asn Thr Val Gly Pro Val Lys Asn Pro Met Ala Thr Val Gly Thr
115 120 125

Met Asn Ser Phe Thr Gly Met Pro Gly Val Gln Asp Asn Phe Pro Gln
130 135 140

Thr Pro Pro Val Asn Val Gln Asp Thr Ser Thr Gln Glu Asn Ser Leu
145 150 155 160

Asp Asn Leu Asn Leu Leu Asp Pro Ser Leu Val Lys Ile Ser Gln
165 170 175

Ala Asp Ser His Ile Lys Glu Ser Met Glu Lys Ala Val His Ser Leu
180 185 190

Lys Lys Val Leu Glu Gly Leu Thr Asn Leu Ala Thr Leu Ser Lys Ser
195 200 205

Arg Asp Thr Glu Pro Phe Asn Val Leu Gly Asp Asp Tyr Thr Met Arg
210 215 220

Asn Val Leu Asp Leu Met Asn Lys Glu Leu Arg Gln Val Glu Ser Leu
225 230 235 240

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Gln Lys Val Val Phe Gln Phe Asn Ala Phe Ala Leu Ser Thr Phe Thr
245 250 255

Lys Ser Pro Asp Asp Asn Lys Lys Ser
260 265

<210> 3
<211> 277
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence of Tp6

<400> 3
Met Ala Gln Ile Pro Val Asp Lys Phe Ala Lys Leu Val Thr Gly Ala
1 5 10 15

Gly Ser Ala Leu Leu Leu Phe Gly Ser Gly Ala Trp Leu Val Asn Ser
20 25 30

Ser Leu Tyr Asp Val Gly Ala Gly His Arg Ala Val Val Tyr Asn Arg
35 40 45

Ile Thr Gly Ile Ser Glu Thr Thr His Gly Glu Gly Thr His Phe Ile
50 55 60

Ile Pro Trp Leu Glu Arg Pro Ile Ile Tyr Asp Val Arg Thr Arg Pro
65 70 75 80

Arg Thr Leu Met Ser Leu Thr Gly Ser Arg Asp Leu Gln Met Val Asn
85 90 95

Ile Thr Cys Arg Val Leu Ser Arg Pro Asp Glu Arg Arg Leu Arg Asp
100 105 110

Ile Tyr Arg His Leu Gly Lys Asp Tyr Asp Glu Arg Val Leu Pro Ser
115 120 125

Ile Ile Asn Glu Val Leu Lys Ser Ile Val Ala Gln Tyr Asn Ala Ser
130 135 140

Gln Leu Ile Thr Gln Arg Glu Arg Val Ser Lys Ala Val Arg Asp Gln
145 150 155 160

Leu Val Asn Arg Ala Arg Asp Phe Asn Ile Leu Leu Asp Asp Val Ser
165 170 175

Leu Thr His Leu Ser Phe Ser Pro Glu Tyr Glu Lys Ala Val Glu Ala
180 185 190

Lys Gln Val Ala Gln Gln Ala Glu Arg Ser Lys Tyr Ile Val Leu
195 200 205

Lys Ala Gln Glu Glu Lys Lys Ser Thr Ile Ile Lys Ala Gln Gly Glu
210 215 220

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Ser Glu Ala Ala Arg Leu Ile Gly Ser Ala Ile Lys Asp Asn Pro Ala
225 230 235 240

Phe Ile Thr Leu Arg Arg Ile Glu Thr Ala Lys Glu Val Ala Asn Ile
245 250 255

Leu Ser Lys Ser Gln Asn Lys Ile Met Leu Asn Ser Asn Thr Leu Leu
260 265 270

Leu Ser Thr Asp Lys
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<210> 4

<211> 9

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of Tp2 Epitope 1 (Tp2.4)

<400> 4

Gln Ser Leu Val Cys Val Leu Met Lys
1 5

<210> 5

<211> 9

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of Tp2 Epitope 2 (Tp2.2)

<400> 5

Phe Ala Gln Ser Leu Val Cys Val Leu
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<210> 6

<211> 11

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of Tp2 Epitope 3 (Tp2.3)

<400> 6

Lys Ser Ser His Gly Met Gly Lys Val Gly Lys
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<210> 7

<211> 11

<212> PRT

<213> Theileria parva

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<220>
<223> Amino acid sequence of Tp2 Epitope 4 (Tp2.4)

<400> 7
Ser His Glu Glu Leu Lys Lys Leu Gly Met Leu
1 5 10

<210> 8
<211> 12
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence of peptide of Tp2

<400> 8
Cys Ser His Glu Glu Leu Lys Lys Leu Gly Met Leu
1 5 10

<210> 9
<211> 14
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence of peptide #43 of Tp2

<400> 9
Phe Lys Ser Ser His Gly Met Gly Lys Val Gly Lys Arg Tyr
1 5 10

<210> 10
<211> 14
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence of peptide #53/54 of Tp2

<400> 10
Phe Lys Ser Ser His Gly Met Gly Lys Val Gly Lys Arg Tyr
1 5 10

<210> 11
<211> 14
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence of peptide #78/79 of Tp2

<400> 11
Phe Ala Gln Ser Leu Val Cys Val Leu Met Lys Cys Arg Gly
1 5 10

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<210> 12

<211> 14

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of peptide #77/78 of Tp2

<400> 12

Lys Cys Phe Ala Gln Ser Leu Val Cys Val Leu Met Lys Cys
1 5 10

<210> 13

<211> 10

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of peptide of Tp2

<400> 13

Ser Ser His Gly Met Gly Lys Val Gly Lys
1 5 10

<210> 14

<211> 12

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of peptide #77 of Tp2

<400> 14

Lys Cys Phe Ala Gln Ser Leu Val Cys Val Leu Met
1 5 10

<210> 15

<211> 12

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence of peptide #36 used as
an experimental control

<400> 15

Phe Ile Ile Tyr Ile Leu His Ser Pro Val Leu Gly
1 5 10

<210> 16

<211> 9

<212> PRT

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<213> Theileria parva

<220>

<223> Amino acid sequence of synthesized peptide named #75,
representing amino acid residues 97 through 105 of Tp2

<400> 16

Ala Gln Ser Leu Val Cys Val Leu Met
1 5

<210> 17

<211> 9

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence OF PEPTIDE #76 of Tp2

<400> 17

Ser Leu Val Cys Val Leu Met Lys Cys
1 5

<210> 18

<211> 8

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence representing amino acid residues
numbers 98 through 105 of Tp2

<400> 18

Gln Ser Leu Val Cys Val Leu Met
1 5

<210> 19

<211> 9

<212> PRT

<213> Theileria parva

<220>

<223> Amino acid sequence representing amino acid residues
numbers 99 through 107 of Tp2

<400> 19

Phe Gly Lys His Gly Leu Gly Gly Ile
1 5

<210> 20

<211> 10

<212> PRT

<213> Theileria parva

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<220>
<223> Amino acid sequence for peptide fragment of
A.A.#49-A.A.#58 of Tp2

<400> 20
Lys Ser Ser His Gly Met Gly Lys Val Gly
1 5 10

<210> 21
<211> 8
<212> PRT
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<220>
<223> Amino acid sequence for peptide fragment of
A.A.#97-A.A.#104 of Tp2

<400> 21
Ala Gln Ser Leu Val Cys Val Leu
1 5

<210> 22
<211> 12
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence for peptide fragment of
A.A.#97-A.A.#104 of Tp2

<400> 22
Gly Asn Cys Ser His Glu Glu Leu Lys Lys Leu Gly
1 5 10

<210> 23
<211> 12
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence for peptide fragment of
A.A.#28-A.A.#39 of Tp2

<400> 23
His Glu Glu Leu Lys Lys Leu Gly Met Leu Glu Gly
1 5 10

<210> 24
<211> 8
<212> PRT
<213> Theileria parva

<220>
<223> Amino acid sequence for peptide fragment of Tp1

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representing amino acid residues #96 to amino acid #103

<400> 24
 Phe Ala Gln Ser Leu Val Cys Val
 1 5

<210> 25
 <211> 525
 <212> DNA
 <213> Theileria parva

<220>
 <223> Nucleotide sequence of Tp2

<400> 25
 atgaaattgg ccgccagatt aattgcctt tactttatta tttacatttt acattccccca 60
 gtgctgggag gtaattgttag tcataagaa ctaaaaaaat tggaaatgct agagggcgat 120
 ggtttcgaca gggatgcatt gttcaaatac tcacatggta tgggaaaggt agaaaaaagg 180
 tatggcttta aaactactcc aaaagttagat aaagtcttag cagatctga aacactgttt 240
 gaaaaacacg gtcttggtgg tatttagaaa gattgtctta aatgtttgc acaaagccta 300
 gtgtcgat taatgaaatg tagaggagca tgtctcaaag gaccatgtac tgacgactgc 360
 caaaattgct ttgatagaaa ctgtaaatct gcattgctgg aatgcattgg gaaaacaagt 420
 attccaaatc catgtaaatg gaaagaagat tatctaaaat acaaattcc taaaacagat 480
 gaggacgaat ctacgaaaaa aggagaagcc tccggcactt catag 525

<210> 26
 <211> 798
 <212> DNA
 <213> Theileria parva

<220>
 <223> Nucleotide sequence of Tp3

<400> 26
 atgaaattaa atactatcgc aatagcctt ttgttattcct gtttctcaca gtttttaaaa 60
 aatgtgtctg ctctgaggcg tagttctcca gatttgtcac cagatggtc ttttcttcaa 120
 gtaaaatcg ctctcctca ggataaacaa gatgtaatcc aaagtccctc tcctaaaggt 180
 acagtgccta cggttgcacc tgaaggcctc aagaaggcgg ttactgcgc agttctatca 240
 aacccaaatc aagctctaca aaacgggtgc cttaatccag cagatttcac tcaagctgcc 300
 tctgttaatt ccatgagtaa tgctgttagt gccatgaaca atactgttgg tccagtaaaa 360
 aatcccatgg ctactgttg tactatgaac tcctttactg gaatgcctgg tgacaggat 420
 aattttcctc agacacccgccc tgtaatgtt caagacaccc ctacccagga gaacagtctt 480
 gacaaccta atctcctctt agatccctcg ttagtaaaga tatctcaagc tgatagtcac 540
 ataaaagaaa gcatggaaaa agctgtacac agccttaaaa aggtcttgg ggggctaacc 600
 aacctgcga ctctgtctaa aagtagggat actgaaccgt ttaatgttct gggggatgac 660
 tatacgatgc gtaacgtttt ggacctcatg aataaggaac tcaggcaggt tgaatctctt 720
 cagaagttg tggccaattt caacgccttt gcactttcca ctttcactaa gagtccagac 780
 gataataaaa aatcctaa 798

<210> 27
 <211> 834
 <212> DNA
 <213> Theileria parva

<220>
 <223> Nucleotide sequence of Tp6

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<400> 27
atggctcaga ttccctgttga taaattcgct aaatttagtta ctggagccgg ctctgctctc 60
ttattatcg gttcagggtgc ctggcttgc aattccagtt tatacgatgt tggagctggg 120
catagagctg ttgttatataa ccgtatcaact ggaataagt agactacaca tggagaagga 180
acgcacttca taattccctg gctagaacgt ccaataattt acgatgtgag gactcgtcct 240
aggactctga tgtctctcac cggaagccgt gacttgcaga tggtaacat cacctgccgt 300
gtgttgctc gtcccgtatga ggcgcagactc agggatattt acaggcactt gggcaaagat 360
tacgacgagc gagtcctgcc ttcaataata aacgaggttc tgaagagttat tggcccccag 420
tacaacgcct ctcagctcat tactcagaga gaaaaggtta gcaaagcagt cagggaccag 480
ctggtaaca gggccaggga cttaatattt cttctcgatg atgtctcctt aaccactta 540
agcttcagtc ctgaatatga aaaggctgtt gaggctaaac aagtagctca acagcaagct 600
gaacgcagta aatatatagt gttgaaggct caggaggaga agaaatcgac gataattaag 660
gctcaggag agtctgaggc tgcaaggctt attggaagtg caattaagga taaccctgcc 720
tttattacgc ttccggagaat tgaaaccgtt aaggaaagtgg ctaacattct ctccaaatcg 780
cagaataaaa tcatgctcaa tagtaatact ctcttactct caactgataa ataa 834

<210> 28
<211> 27
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 Epitope 1 (Tp2.1)

<400> 28
caaaggcttag tgtgcgtatt aatgaaa

27

<210> 29
<211> 27
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of Tp2 Epitope 2 (Tp2.2)

<400> 29
tttgcacaaa gcctagtgtg cgtatta

27

<210> 30
<211> 33
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of Tp2 Epitope 3 (Tp2.3)

<400> 30
aaatcatcac atggtatggg aaaggttagga aaa

33

<210> 31
<211> 33
<212> DNA
<213> Theileria parva

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<220>
<223> Nucleotide sequence of Tp2 Epitope 4 (Tp2.4)

<400> 31
agtcatgaag aactaaaaaa attgggaatg cta 33

<210> 32
<211> 22
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 forward primer for
expression cloning

<400> 32
ggtaattgt a gtcataaga ac 22

<210> 33
<211> 24
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 reverse primer for
expression cloning

<400> 33
tttactaata ccaccaagac cgtg 24

<210> 34
<211> 37
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 forward primer for gene cloning

<400> 34
gccgcacca taaaattggc cgccagatta attagcc 37

<210> 35
<211> 39
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp3 forward primer for gene cloning

<400> 35
gccgcacca taaaattaaa tactatcgca atagcctt 39

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<210> 36
<211> 37
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp6 forward primer for gene cloning

<400> 36
gccggccacca tggctcagat tcctgttgat aaattcg

37

<210> 37
<211> 24
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 reverse primer for gene cloning

<400> 37
ctatgaagtgc cggaggctt ctcc

24

<210> 38
<211> 28
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp3 reverse primer for gene cloning

<400> 38
tttaggatttt ttattatcgt ctggactc

28

<210> 39
<211> 31
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp6 reverse primer for gene cloning

<400> 39
tttatttatca gttgagagta agagagtatt a

31

<210> 40
<211> 26
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 internal forward primer for
gene cloning

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<400> 40
tccatgtaaa tggaaagaag attatc 26

<210> 41
<211> 26
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 forward primer for gene cloning

<400> 41
ggaactcagg caggttgaat ctcttc 26

<210> 42
<211> 24
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence Tp2 forward primer for gene cloning

<400> 42
ccgctaagga agtggctaac attc 24

<210> 43
<211> 23
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of vector-specific forward primer

<400> 43
acgccaggat ttcccagtc acg 23

<210> 44
<211> 21
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of vector-specific reverse primer

<400> 44
gagcgataaa catcacacag g 21

<210> 45
<211> 33
<212> DNA
<213> Theileria parva

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<220>
<223> Nucleotide sequence of Tp3-specific forward primer

<400> 45
cgcggatccg ccaccatgaa attaaatact atc

33

<210> 46
<211> 32
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of Tp3-specific reverse primer

<400> 46
cgccctcgagg gatttttat tatcgctctgg ac

32

<210> 47
<211> 33
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of Tp6-specific forward primer

<400> 47
cgcgtctagcg ccgccaccat ggctcagatt cct

33

<210> 48
<211> 32
<212> DNA
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<220>
<223> Nucleotide sequence of Tp6-specific reverse primer

<400> 48
gcgcgtcgagt ttatcagttg agagtaagag ag

32

<210> 49
<211> 33
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of specific forward primer for
adding a tag (HIS) to gene sequences

<400> 49
cgccctcgagt cctacataacc atctgccgaa aag

33

<210> 50
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<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of specific reverse primer for
adding a tag (HIS) to gene sequences

<400> 50
cgcaagctt cagtctagtc ctagcaaagg gttag

35

<210> 51
<211> 33
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of specific forward primer for
PCR amplification of Tp3 sequences

<400> 51
cgcggatccg ccaccatgaa attaaatact atc

33

<210> 52
<211> 35
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of specific reverse primer for
PCR amplification of Tp3-pTargeT sequences

<400> 52
cgcaagctt cagtctagtc ctagcaaagg gttag

35

<210> 53
<211> 33
<212> DNA
<213> Theileria parva

<220>
<223> Nucleotide sequence of specific forward primer for
PCR amplification of Tp6 sequences

<400> 53
cgcgctagcg ccgccaccat ggctcagatt cct

33